**Preliminary Questions/Comments**

**Project: Cat Canyon Oil Field-Sisquoc and Monterey Formations**

## General Project and Aquifer Information

1. General Questions about the Application
    a. Section 8 of the application provides a response to the requirements at 40 CFR 146.4(b)(1)(2) and (3) and says that (b)(4) is "not applicable." The application also responds to 40 CFR 146.4(c) with a treatment feasibility study in Appendix 6-I. Please confirm that the aquifer exemption is requested pursuant to 40 CFR 146.4(a) and (b)(1).

2. Areal Extent of the Aquifer Proposed for Exemption
    a. Are separate shape files available for each formation that show: the existing exempted area of the Sisquoc and Monterey Formations, and the area of the Sisquoc and Monterey Formations proposed to be exempted?
    b. Is information available to complete the following table for each formation (which EPA will need for the final decision document)?

| AE Boundary Vertex Point Number | Township | Range | Section | Latitude | Longitude | Top Formation, Subsea Depth (feet) |
|---|---|---|---|---|---|---|
| | | | | | | |

3. General Project Information
    a. Do all eight operators identified on page 8 of the application have injection wells in the area proposed for exemption, or only the four that are listed on page 16?
    b. How many Class II D and Class II R wells are in the area proposed for exemption?

4. Information about the Aquifer Proposed for Exemption
    a. The application states on page 120 that the sands of the Sisquoc Formation that comprise the producing intervals are named the S1b through S9 or S10, with the basal sands being locally named as the Brooks, the Thomas, and occasionally the Santa Margarita. Table 1.2-1 also mentions the Los Flores. Is this interval part of the previously exempted Sisquoc Formation?
    b. The application states on page 121 that in the West Area of the field, the Monterey Formation is sometimes named Los Flores. However, Table 1.2-1 indicates that Los Flores is part of the Sisquoc Formation. Please clarify.

5. Depth and Thickness of the Aquifer Proposed for Exemption
    a. The application states on page 66 that the Sisquoc Formation ranges from 1,800 to 2,500 feet thick; however, on the north-south trending cross sections it appears to thin to about 800 feet to the north.
        i. Please clarify whether this depth range refers to the entire Sisquoc Formation, including the confining portion, or only the portion of the Sisquoc Formation that is proposed for exemption.
        ii. If it refers to the entire Sisquoc, what is the thickness of the portion of the Sisquoc Formation that is proposed for exemption?
    b. Why is the S1b interval not shown in cross sections D-D', E-E', or H-H'?
    c. What is the average thickness of each formation that is proposed for exemption?
    d. Please provide the depth to the top of each formation proposed for exemption in depth below ground surface and relative to mean sea level (provide an average and a range, if possible).

6. Information on the TDS Content of the Aquifer
    a. Most of the TDS data are from the currently exempted areas. Are any additional TDS samples available from within the areas of the formations that are proposed for exemption?

**40 CFR 146.4(a) Criteria Support**

7. Permeability and Porosity
    a. On page 120, the application states that the Sisquoc S1b-S10 sands have permeability as high as 3 Darcy. However, on the spreadsheet in Appendix 4-1, permeabilities based on conventional core data as high as 8 Darcy are shown. Please clarify.
    b. The application, on page 120, says that the Sisquoc S1b-S10 sands range in porosity from 25% to 63%; however, according to the spreadsheet provided in Appendix 4-1, porosity values based on conventional core data range from 2.3% to 48.8% in the Sisquoc Formation. Please clarify.
    c. Please clarify which sidewall core values in Appendix 4-1 are specific to the portion of the Sisquoc Formation that is proposed for exemption.
    d. The application on page 66 states that core data in the Monterey Formation is not considered representative of the total formation properties due to localized natural fracturing. If this is the case, what is the basis of the porosity/permeability values for the Monterey Formation cited on pages 66 and 121 of the application?

8. Upper Confinement
    a. What data were used to create the isochore map in Figure 6.1-2 and cross sections J-J' and I-I' that show confinement in the northern area proposed for exemption, and are they from throughout the area mapped?
    b. Please provide thickness information for the sub-units of the Sisquoc Formation, particularly the Upper Sisquoc Confining Layer.

9. Lower Confinement
    a. What is the thickness of the Lower Sisquoc siltstones and claystones that provide lower confinement?
    b. The application, on page 66 describes the basal sand contained within the Lower Sisquoc claystone.
        i. Does this refer to the intermittent sands that DOGGR discussed with EPA in February 2018?
        ii. Do these sands contain water with a TDS content of less than 10,000 mg/L? If so, please describe the evidence for hydraulic isolation of these intermittent sands.
    c. Figure 3.2-2 shows the Monterey Formation in contact with basement serpentinite in T8N R32W Sections 9 and 10. How does the serpentinite body affect lower confinement?

10. Lateral Confinement
    a. Is a map available that superimposes the sealing faults described throughout the application onto the area proposed for exemption? This would demonstrate how the faults provide confinement/relate to the AE boundaries.

11. Lateral Confinement to the East
    a. The available pressure data across the normal fault in T8N R32W Sections 3 and 10 is from wells that are several miles from the southern portion of the eastern boundary of the area proposed for exemption. What evidence is there that the fault's sealing properties are similar in the southern portion of the eastern boundary of the area proposed for exemption?
    b. Please explain the mechanism for containment in the northeast corner of the area proposed for exemption (i.e., in the North Area Fault Block in T9N R32W Section 7, and T9N R33W Section 12).
    c. Please explain the mechanism of confinement along the southeastern boundary of the Monterey Formation AE in T9N R33W, Sections 20, 21, 28, 29, 33, and 34.
    d. For the Monterey Formation, the application states that the Garey Fault is sealing, but no supporting data are provided. Please provide evidence that this fault is sealing.

12. Lateral Confinement to the North

    a. Please describe where other productive sands of the Sisquoc Formation pinch out in the north relative to the S1b.

        i. Does the entire Upper Sisquoc pinch out?

        ii. What productive units in the Monterey Formation extend to the north of the area proposed for exemption, and do they pinch out at or before the northern boundary as well? What data/evidence are available to support this information?

13. Lateral Confinement to the West

    a. The application states that the Bradley Canyon Fault is sealing, but pressure data from only two wells on the eastern side of the Bradley Canyon Fault in the Monterey Formation are provided. Please provide additional evidence that the Bradley Canyon fault is sealing on the western boundary of the area proposed for exemption.

    b. Please clarify which productive units are encompassed by the western boundary of the AE and whether they are all confined by the pinch-outs described in the application.

        i. If they do not all pinch out within the AE boundary, what is the means of confinement along the western boundary of the Sisquoc Formation that is proposed for exemption?

    c. Please clarify the mechanism for confinement along the western boundary of the area proposed for exemption in the North Bradley Canyon Fault Block (T9N R33W Sections 15 and 16).

14. Lateral Confinement to the South

    a. What is the mechanism of confinement for each formation in the extreme southern tip of the area proposed for exemption? What lower units are contained in this boundary?

15. Ground Water Movement

    a. In Table 5.1-7, the "cumulative to 1977" numbers do not appear to total to the "balance number" shown. That is, (228,852,985+898,501,621) – (176,028,000+33,360,333 + 63,722,653) equals 854,243,620 not -805,407,026 as shown on the table. Please clarify the discrepancy.

    b. Are the "cumulative to 2016" numbers on Table 5.1-7 inclusive of the "cumulative to 1977" numbers?

    c. Are the cumulative data up to 1977 in Table 5.1-7 considered to be unreliable/poor quality (and therefore not be used to support the evaluation of ground water flow), or is it simply incomplete?

    d. Table 6.2-1 shows that the volume injected exceeded the volumes withdrawn for several years (e.g., 1979-1982 and 1987). What information is available to support a determination that this scenario will not recur?

    e. How do the mass balance values in Tables 5.1-7 and 6.2-1 compare? The sum of oil and water produced in Table 6.2-1 does not match the values in Table 5.1-7, or the difference between the cumulative to 2016 minus the cumulative through 1977 values in Tables 5.1-7. Please clarify.

f. The text of the application says that Table 5.1-7 shows cumulative production and injection data up to 2016; however, the mass balance data in Table 6.2-1 contains 2017 data. Please clarify the discrepancy.
g. In Appendix 5-V, the total amounts produced and injected on the tables "Production Assigned Zones" and "Injection Assigned Zones," respectively, do not match the information on Table 5.1-7. Please explain what those tables represent. Furthermore, the data presented as Table 6.2-2 in the file "DOGGR Injection & Production Data" in Appendix 5-V does not match Table 6.2-2 in the application. Please clarify the discrepancy.

16. Information on Drinking Water Wells

a. Do the Alluvium and Paso Robles Formation of the San Antonio Basin serve as the water supply for all drinking water uses in the area of the Cat Canyon Oil Field?
b. The application, on page 101, references a 2016 letter to B. Falkenhagen about the Los Alamos census designated place's (CDP's) well. Please provide a copy of this letter for inclusion in the record.
c. What is the source of water for the community of Sisquoc if the Golden State Water Company's wells are currently inactive?
    i. Please include any active water supply wells for the Sisquoc Community on the inventory table.
    ii. Why are the Sisquoc Community CDP's two legacy wells (shown on Table 5.2-2) not included on Table 5.1-1? Please add them to the table for completeness and provide depth and screen/completion formation.

17. Water Well Table

a. Are the individual residential wells for the community of Garey on the inventory? If not, please add them to Table 5.1-1.
b. Do the wells identified as "domestic/irrigation" or "domestic/agricultural" on Table 5.1-1 have any potential use for human consumption? In particular, what information is available about CC197, a domestic/irrigation well completed in the Careaga/Foxen/Sisquoc, to ensure that this well does not provide drinking water?
c. Is depth/completion formation available for well CC066, a domestic well within the area proposed for exemption? If not, on what basis does DOGGR state that the well does not draw from the aquifers proposed for exemption?
d. There are several typos/misspellings on Table 5.1-1 (e.g., in the purpose column). Please correct these so that EPA can include the table in the record of decision document.
e. Several wells on Table 5.1-1 are completed in the "Orcutt/Paso Robles/Careaga." Where is the Orcutt Formation relative to the formations that are proposed for exemption?
f. The application says on page 9 that there are agricultural water wells completed in the Careaga Formation and the Foxen Formation located stratigraphically above the Sisquoc oil sands. However, according to Table 5.1-1, two irrigation wells (CC140 and CC141) are completed in the Alluvium/Paso Robles/Monterey. Please clarify why the text does not mention that wells are completed in the Monterey Formation.

g. Well CC225 appears to be an irrigation well shown on Cross Section K-K' as completed in the Alluvium/Upper Sisquoc at 60 feet bgs. However, according to Table 5.1-1, this well is completed at 50 feet. Please clarify.

**40 CFR 146.4 (b)(1) Criteria Support**

18. Logs and Core Data

    a. According to the summary spreadsheet in Appendix 4-1, oil saturation values for the Monterey Formation range from 0 to 22.3%. On what basis is this formation considered to be oil productive; that is, what data indicate that the Monterey Formation is a producing zone, as the application notes on page 137?

19. Production Data

    a. What is the start date of the "cumulative to 1977" numbers on Table 5.1-7?